

Land Infocracy.

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Globally, contemporary forces are changing the way land is managed and administered. These include a wide variety of technological innovations, post-conflict behavior and contexts, rural poverty and food security. Information about ownership or other rights to land and real estate is a source of power and authority struggles. Construction of the information models, access to such information and maintenance of the information systems is often limited to few actors, whilst the beneficiaries of the information, the land right holders, are multiple. This research aims at constructing and testing a theoretical model of land infocracy. Such a model can provide a better insight in strategic behaviour and strategic solutions of actors administering land and land information. The model is derived through a neopragmatist research approach, which inducts observed professional behavior into a cyclic development a theoretical model. Testing and adapting the model relies on 3 case studies, where land information is constructed in 3 different infocratic contexts: state-led information construction, non-state or private firm information construction and citizen-platform information construction. In each context the social context and strategic behaviour is compared. The outcome of the research is not only relevant for developing countries where land administration is incomplete or ineffective, but also for western countries where the adoption of ICT is occurring alongside organizational changes (e.g. mergers) of cadastres and land registries. Furthermore, it is timely and opportune for international development policies, which list resolving land issues as a priority.

Introduction

Information about ownership or other rights to land and real estate is a source of power and authority struggles. Construction of the information models, access to such information and maintenance of the information systems is often limited to few actors, including government agencies, private companies or other non-state organization, or citizen-based platforms. During the construction of the information systems, the designers or practitioners exercise discretionary decisions on how to construct the systems, which land information is considered relevant or non-relevant, and which rights and restrictions should be included and displayed. The main beneficiaries of the information, the land right holders, are often not included during this design process. As a result, certain physical artefacts, such as trees, natural boundaries or religious spaces, which may be of relevance to local societal and religious institutions, may be left out as relevant objects and associated land information. These are then excluded from the formal systems. One or more public state-based agencies usually execute the maintenance of these system, by maintaining formal registers and organising regulated work processes. This provides them authority in land matters.

The uptake of information and communication technology (ICT) has long been seen as a solution to conflict. ICT can execute formal tasks of registration, mapping and information provision much more efficient than conventional technologies. Land agencies and land development projects have therefore heavily invested in acquiring and adopting ICT, assuming that more efficient

administration would also create more effective authority. Yet, adopting ICT also introduces new power and dependency relations (de Vries, 2008). It introduces discretionary behaviour of staff members and battles over information access (de Vries, 2013). Moreover, with the uptake of social media, citizens and advocacy groups have become more effective in mapping their own interests in land, thus potentially creating alternative systems of land registration which could complement, but also challenge, formal systems. ICT thus introduces a new authority predicament on land matters.

However, in more than 75% of the countries worldwide the formal systems are incomplete and inefficient, leaving some 70% of the global population outside formal authoritative arrangements (UN-Habitat, 2012). The uncertainty arising from this hampers development and questions authority: land grabbing, land disputes and land speculation emerge amongst others. Power on land becomes inexplicit and fragmented, as the formal authority vested in public land agencies battles with the authority of informal arrangements and practices. As land authority is challenged by both informal arrangements and the adoption of ICT there is a need for a theoretical model of land infocracy: a model which connects emerging developments administrating land to changes in organisational power and authority by ICT, and which explains and predicts how actors use (land) information as a means to consolidate their power and authority, or as a means to alter existing relations of authority. Such a model can help land agencies at the brink of a strategic change, land information actors to better protect their land interests, and society to derive a smarter land management and administration.

Big research question:

How does the adoption of ICT in land matters change the authority on land matters, and how can a theoretical model of land infocracy provide better insight in strategic behaviour and strategic solutions of actors managing land and land information.

The question is not only relevant for developing countries where land administration is incomplete or ineffective, but also for western countries where the adoption of ICT is occurring alongside organizational changes (e.g. mergers) of cadastres and land registries. Furthermore, it is timely and opportune for the international development policy, which listed resolving land issues as a priority.

Knowledge Gap

As the practice of land matters is often treated in disconnected scientific domains (geodesy, law, public administration, development studies), there is no comprehensive theory of land infocracy. Such a new theoretical understanding is however needed to support land beneficiaries who are often confronted by single domain practitioners (land surveyors, valuers, legal practitioners, etc.) who rely on contrasting epistemic practices and objectives. This interdisciplinary disconnect stems from the disciplinary principles and norms which are translated into conflicting metanarratives of professional practices, rules and standards. This prevents improvements in legitimacy and authority of land information and can lead to power conflicts over land and land information. Overcoming the conflicting metanarratives requires a narrative where both the authority over land and over land information is intrinsically dynamic and progressive. By accepting that land authority is not stable over time and place, legitimacy becomes a product of intersubjective agreement, rather than reasoned persuasion. A dynamic land infocratic model is different from current paradigms of land administration which tend to conceptualise authority as a static entity, usually equated with highly regulated institutional mandate and accountability of state-based agencies without any discretionary or strategic behaviour.

The dominant discourse about cadastres and land information agencies is that when successfully embedded, cadastre and registry institutes are said to underpin economic development (De Soto, 2001; Deininger, 2003; Williamson et al, 2010). For citizens they secure land tenure rights, enable access to credit, minimize land disputes, and expedite land dealings. For governments they enable

land taxation, provide a complete inventory of lands, facilitate land transaction controls, and enable administration of many other activities (Henssen, 2010). Whilst not the only factor enabling sustainable economic development, 'good' cadastres and registers are considered an essential prerequisite in this perspective.

Globally, such 'good' cadastral and registration institutions exist in a minority of contexts: perhaps only thirty-five (35) to fifty (50) countries enjoy highly embedded systems (Roberge, 2012). These countries are most often the highly developed member states of the Organisation for Economic Co-operation and Development (OECD). In less developed countries, cadastral and registration institutions tend to be weaker and in various stages of establishment, renewal, or decay. It is in these areas that the majority of the world's four (4) billion unregistered land interests exist: only twenty-five percent (25%) of the world's land interests are estimated to be recorded in a formal, state-based system (Roberge, 2012).

If the arguments of these land economists and land administrators are followed these less developed countries will remain as such until the billions of unregistered land holdings are more formally (=legally) recognized. Hence, this is no trivial task, and may therefore not be the only path towards 'good' cadastres. At current rates it would take many decades or even centuries to achieve complete coverage in many countries (Zevenbergen, 2013). Meanwhile, in cities the number of slums continues to grow and the number of poor is not decreasing. Alternative views, perspectives and technologies are thus crucial.

The challenge is therefore to develop faster, cheaper, and more fit-for-purpose methods for establishing, renewing, and maintaining cadastres and registers in developing contexts. Many innovations are already evident. Most are underpinned by the concept of the continuum of land rights (Payne, 2001, UN-HABITAT, 2008): a staged approach to delivering land tenure security. The premise is that lower forms of land tenure right recognition should be undertaken prior to implementing land titling projects with full legal security and highly accurate boundary surveys. Tools and approaches that already support the continuum concept include: the Land Administration Domain Model (LADM) (Van Oosterom et al, 2006); the Social Tenure Domain Model (STDM) (Lemmen et al, 2007; Lemmen, 2010; Lemmen, 2012); using map documents from colonial periods to fill gaps in records; allowing non documentary forms of evidence for adjudication processes; using high resolution satellite imagery (HRSI) for adjudication tasks (Lemmen and Zevenbergen, 2010); acquiring low altitude remotely sensed imagery (LARSIS) for boundary surveying tasks (Jing and Zevenbergen, 2011); using global navigation satellite systems (GNSS) for low cost ground control for boundary surveys (Abidin et al., 2011); utilizing single geographic points to represent parcels rather than complete boundary surveys (Antwi et al, 2012); utilizing digital pens to streamline adjudication tasks; and many others. Each approach seeks to lower the time and costs of building and maintaining cadastres and registers.

Concepts

The research introduces a model of land infocracy, which combines concepts of authority and control, socio-informational interactions, information updates and discretionary space. The exploratory conceptual framework of this research can be summarized as in Figure 1:

Land infocracy perspective on land information

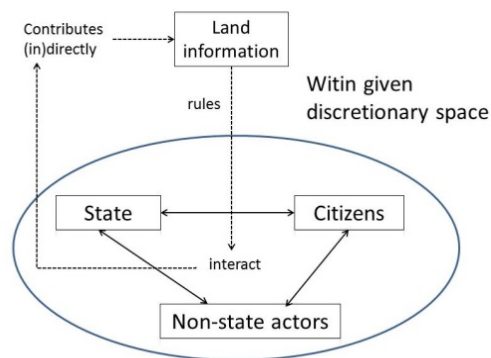


Figure 1. Exploratory conceptual framework of dynamic land infocracy

The framework emphasizes that available and accessible land information is being influenced by how interactions between land actors and beneficiaries land take place, and how these interactions continuously provide an update to land information and land authority. It is assumed that access and usage of land information is however filtered through discretionary decisions of both land administrators and land information system designers. This is a different notion than conventional views on land information. Instead of assuming that disciplinary professional norms and standards derive neutral information and support land administration in a single way, this research argues that authority over land, enacted through interactions between land actors, is evolving continuously because of discretionary access and usage of land information. This leads to dynamic practices of handling land problems and new information contributions.

This model provides an alternative for current frameworks. Public administration literature tends to deduce power in land to relations between state and citizens given a territorial land boundary. Land information is then a tool to simplify land relations and legitimize authority (Scott, 1998). Land information, though influential and providing legitimate decisions, is however treated as support tool for governance rather than as authority factor. Land administration literature treats land information as an end product of administration, yet tend to regard it as value-neutral. The introduction of the neocadastre concept (de Vries, Bennett, & Zevenbergen, 2014) is indeed a first step acknowledging that values of state-based land registers and of institutionalizing practices of generating land information need to be connected. Yet, how this connection is shaped is still unknown. Considering that land information is (socially) constructed, it is both dynamic in content and shape, and dependent on particular values or frames. This affects the degree of authority derived from the uptake of land information.

Approach

A (neo)pragmatist approach (Putnam, 2001; Rorty, 1979; Wicks & Freeman, 1998) is useful to build a theoretical model of land infocracy. It requires a cyclic process of theory building in relation to observation of practice. Discretionary behavior associated with the uptake of ICT can be considered the result of subjective perceptions on ICT and land information, constructed by personal experience and by social interactions. Modelling such behavior has to connect practical knowledge gained through social interactions with theoretical knowledge of social theories. The resulting effect on authority advances from the admission that authority is a necessary element of the relationship between land agencies and the land polity as they come together to solve land problems (Kasdan, 2011). The research develops the understanding of discretionary behaviour and the authority effect by testing and upgrading the model in subsequent case studies.

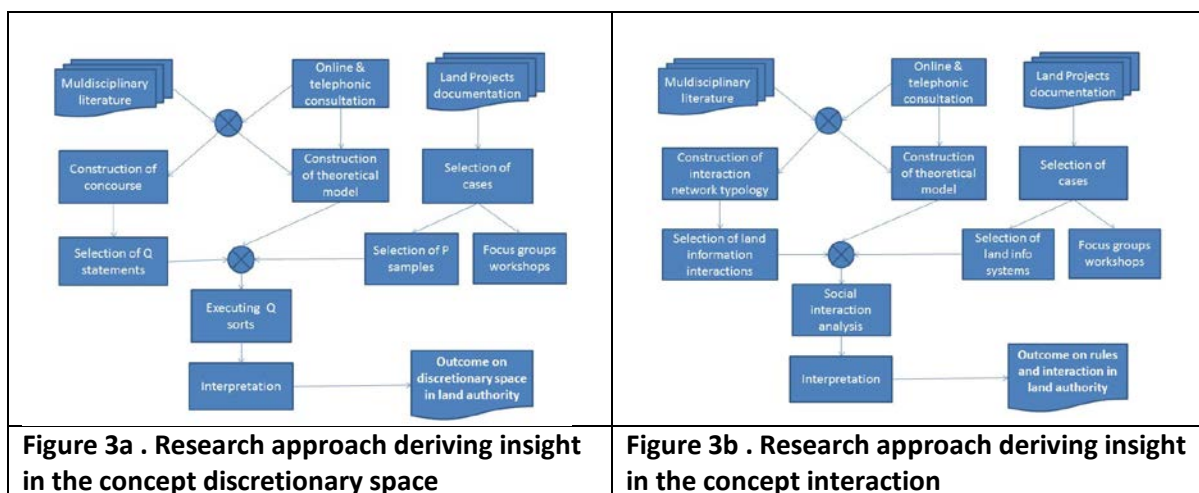
Overall aim:

Use a neopragmatist approach to construct and test a theory of dynamic land infocracy

Methods and Techniques

The research relies on Q methodology and Social network analysis. Q methodology is a particular research technique to analyse and cluster personal viewpoints of a given set of participants in a systematic way. It combines statistical calculations (such as factor analysis) with interpretation (Brown, 1980; Watts & Stenner, 2012). Social network analysis is an approach to understand social interactions by specifically identifying points of contacts in a social network and type and frequency of interactions (Ahuja, 2000; Omran & van Etten, 2007).

The empirical tests follow two simultaneous paths. One deriving insight on discretionary spaces and one deriving the de facto information rules. The tests of theory employ Q methodology with PQ Meth software to qualify and quantify the breadth and shifts in subjective discretionary spaces. Social network analysis and Gephi software is used to qualify changes in social interactions. Both types of analysis are conducted in 3 cases in land administration where the Netherlands development cooperation has been active, each with a different focus. Each case represents a different land information coordination strategy based on its institutional context and organizational development strategy. Figures 3a, 3b show the subsequent steps of the research framework.



Three international case studies of land information innovations are selected to test the land infocracy model. These cases are Uganda (state-based land information system), Rwanda (state - private firm –based land information system) and the specific Indonesia Larasita program (which collects land data through a mobile office in local areas, and can thus be considered citizen-platform-based land information system). Larasita challenges conventional methods of information coordination, which is a centralised and standardised practice of constructing and maintaining land information. Rwanda conducted a new adjudication processes followed by the introduction of central and local land information system. This challenges traditional forms of land tenure and fragmentation in maintaining land records. The introduction has triggered local economic development forces in urban regions, and thus has had direct effects on land authority.

Case Findings

At the time of the writing of this paper the data collection was still in the initial phase. Yet some preliminary findings can already be reported and initial conclusions can be drawn. For Uganda an initial methodology process was started, for Rwanda the data relied primarily on previous collaborative studies whereas for Indonesia the data were collected through exploratory interviews to seek more insight in the concourse of land registration in Indonesia. No Q sorting could be conducted yet in Rwanda or Indonesia.

The basis for the Q analysis was a first set of 24 statements, which was tested with a number of participants. These statements were built on a set of beliefs which were categorized according to 4 possible archetype belief systems on land administration and land management (Table 1). :

Execution	Ask each participant to rank 24 Q statements in Q diagram from -3 to +3, and distribution 1,3,5,6,5,3,1 statements. Then identify differences and communalities in views.			
Core beliefs	State-based institutions should cater for land policy	Private companies should cater for execution of land policy	Results count; whatever works given time/context should be pursued for execution of land policy .	Community participation is crucial in the development and execution for land policy .
Secondary beliefs - Rules/policies to achieve core views	The land act should primarily regulate how the national and agency executes tasks and functions	The land act should primarily regulate how surveyors, notaries, conveyancers and private valuers should execute tasks and functions	Professionals in land should have the discretionary freedom to decide on technical tools they use for each purpose.	Communities can decide for themselves who has rights to land and who not.
Policy beliefs - Tools to implement policies	All land transfers of couples require both the name of the man and the woman	Land transfers should be based on willing buyer/willing seller or inheritor regardless of the gender.	Transfers of land should be registered whenever there is a benefit for the buyer, seller, inheritor	Transfers of land remain under the authority of community leaders and/or customary rules.
Equity to land rights	Equity in land rights is dependent on national legislation and national culture	International market pressures are most crucial for equity	Project context, ad hoc results and opportunities are most crucial for equity	Degree of cohesiveness and compactness of community is most crucial for equity
Openness	Legislation fosters transparency (in land matters)	Market pressures foster transparency (in land matters)	Transparency can emerge in an ad hoc manner (in land matters)	Customary rules govern the degree of transparency (in land matters)
Education	There should be single formal curriculum in land administration and management	Education and training programmes in land administration should vary and should be based on competition between providers	Education and training should be based on local needs and immediate results which can be obtained	Communities and families need to be upgraded in their own customary forms of land administration and land management

Table 1. Basic set of Q statements

Case A – Uganda

Overall, it was acknowledged during the information collection that the land sector is clearly a sector where discussions, recommendations, expectations and follow-up actions can be more sensitive than in other sectors. It is similar to other sectors where it concerns the potential resistance to cooperate in an assessment when there exists a perception that people might lose their jobs, yet it is dissimilar where it concerns the framing and understanding of the land sector issue itself. A direct consequence of this observation is that the first phase of assessing the discourse and assessing the frames which are current and accepted is a crucial requirement. Q methodology (Webler, Danielson, & Tuler, 2009) is one appropriate tool which can help to identify the frames of the operant discourse of land policy development in a national context.

Although frequently used for the purpose of revealing different operant views, Q methodology is relatively novel for the land sector. The Q methodology was not well-known nor easily understood by participants. Though the use of statements was considered acceptable, the content of the statements created discussion and confusion. The guiding factor in evaluating the validity of the Q statement was the current status of land issues in Uganda. As a result, a collective position was derived, being a mix of archetype views, with an inclination towards state-based guidance and control and disfavoring community-based approaches. This was however very much dependent on the group members during the discussion. At the same time, it also derived a set of additional statements, which could be incorporated immediately in the design. In the original design, there were only 24 statements, whereas a number between 35 and 45 seems more conventional. In any case the number of participants completing the Q sort should be less than the number of items in the Q set.

Seeking discussion and subjective feedback is indeed the main purpose of Q methodology in order to get the best overview of the breadth and width of the current policy discourse, but at the same time some alternative statements were constructed to guide any discussion on the statements better. Overall, it was however advised to provide more clarity on the purpose, goals and execution of policy discourse analysis and the way the Q methodology should be carried out to support that. Also provide the opportunity in the assessment sequence to skip this step altogether if the policy goals are already considered widely agreed upon.

Crucial remains the fact that the outcome of a Q analysis needs to be carefully executed and interpreted. A basic set of Q statements is useful, but may also need to be extended if considered appropriate in a given case. The execution should always be done with Q participants individually, whereas the interpretation - the description of the discourse and the formulation of the basic policy positions in a national context - may be executed with a focus group of stakeholders. If there is really no debate (possible) about the goals of the land policy is only relevant in a very limited context (e.g. within a single organization) then the step can be avoided.

A potential problem which may occur at this stage is lack of transparency and accountability. Often local governments and districts lack technical capacity or lack clear resources to actively take part in any assessment exercises, and thereby tend to leave the main responsibility to national government agencies. Part of the reason is that land policies have tended to prescribe a fixed set of human resources and their functional skills levels for local level government offices irrespective of the local context of local need for such resources. In case of administrative reform - usually resulting in more local government offices - the required human resources cannot be easily attracted or are simply not available. Moreover, capacity assessments should take expectations of local farmers into account. It should provide some hope for local farmers on what will happen to land if they participate in any assessments. Also the assessment should include whether there is any legal aid (pro bono) present for local subsistence farmers.

Another problem is the potential neglect for customary traditions and rights. Conventional efforts are largely based on how western tenure systems are managed through standard government agencies. There is insufficient attention for knowledge and acquaintance with customary traditions and rights, such as family rights. Many legitimate land tenants do not know how the registration system works and what the implications are when converting their tenure to rights. Under customary tenure, there are many rights included which may be lost in conversion. Conversion can thus potentially have negative implications for women and children. Both customary land owners and administrators would need to know about such implications. As a result, the assessment needs to incorporate means to assess these issues as well.

There has to be a continuous and comprehensive communication strategy, in order to manage realistic expectations and anticipated (strategic) behavior. Although disputed among workshop participants, the end results of the assessment should be available to multiple stakeholders if the assessment relates to the national land policy and the wider system of capacity development (in other words, if capacity and land policy are still unstructured problems). If on the other hand the capacity development assessment refers to the more narrow system of land policy, i.e. the capacity assessment of a single organization such as the land agency and all their respective offices, than a more limited distribution of results would be recommended.

Case B – Rwanda

After the genocide of 1994 the claims on land gradually increased. There was a large mix of land rights resulting from consecutive conflicts

- 1) First conflict (1959) resulted in half a million refugees (Tutsi) in neighbouring countries -> in 1962 land distributed to Hutu peasants as secondary occupants
- 2) 1994 > 2,5 million refugees and almost 1 million people killed -> secondary and tertiary occupation of land
- 3) After genocide 1994 -> massive return of refugees, all reclaiming land; Hutus fled
- 4) After 1997, stable country -> half a million Hutus returned, saw that land they had occupied for 3 decades had been returned to Tutsi refugees (or their descendants) of 1959
- 5) Additional 'problem' -> polygamous marriages, resulting in inheritance problems and additional land claims

In short, massive overlapping land claims. As there had been various periods of internal conflicts causing different phases in which refugees left their land, returnees returned to claim land and rules occupied land, alongside a system of polygamous marriages, in 2004, the government of Rwanda adopted a land policy and a land law to end most of the overlapping claims and persistent land conflicts. This was done by a series of presidential orders, ministerial decrees and other regulations. The aims of these were to establish a more equal and indiscriminate land tenure system, where tenants would have more tenure security, and the State would be able to better manage and control land use rights. The solution which was formulated was the Land Tenure Regularization Program (LTRP), a nationwide program aimed at registering land all over Rwanda (approx. 10 million parcels).

The execution of this registration process started in 2009 and was completed in 2012. Though applauded internationally as a high achievement 1,494,943 parcels were not yet registered (14% of demarcated land) and remained under dispute.

Alongside the changes in the legal system Rwanda began the process for establishing a land administration system: all rightful claimants would be provided legally valid land documents through a systematic land registration process. The land information was collected in a participatory manner: parcels were surveyed by grass root surveyors using aerial images and a general boundary approach. The resultant land information was gathered into a digital land register: the Land Administration Information System (LAIS). LAIS was intended to support the maintenance phase. Whilst the initial land registration was systematic, the updating process would be sporadic: transacting parties would come on an individual basis to district land offices and report changes.

Case C - the Larasita program of land adjudication in Indonesia.

The Larasita program in Indonesia started in December 2008 in Klaten, Central Java (Reddick et al. 2011). The program offers a mobile land registration service for local rural communities. The registration process does not take place at a local land office but through a moving office in a minibus that comes directly to village communities. Together with the communities the Larasita staff members carry out a cadastral survey, including the demarcation of boundaries. The minibus is equipped with ICT that can connect to BPN's server, the country's central land registration office. The program offers a mobile land registration service for local rural land users, whereby the previously unregistered landholders can identify themselves.

The pilot projects of the Larasita program were chosen by the national land agency in Indonesia (BPN). The criteria to execute the voluntary land registration were site location (location had to be far from a local land office; the socioeconomic status of the community should be reasonable; there should be demand from the community) and number of potential land users (there should be a limited number of registered parcels). The Tirtomulyo village in the Bantul district in the Yogyakarta province was among the first villages where the Larasita province was tested. Reddick et al. (2011) investigated in this village how the project officers executed these tests, and compared it to the process of land registration where Larasita was not present, the village of Donotirto, a neighbouring village of Tirtomulyo. In a similar way, Djoko (2013) and Megawati (2013) investigated the practice of Larasita in Banjar (south Kalimantan) and Kalitenga in region (kabupaten) Sidoarjo respectively.

These different case studies exhibit similar problems in the process of registration itself. On a more general level, these are qualified as problems of communication (between BPN / cadastre officers and local communities) or problems of resources (either human resources to carry out the entire process or lack of equipment). More specifically, all case studies refer to detailed procedural problems. As part of the process, the communities identified themselves through the local head of the village community, the Dukuh. The process of registration was also through the Dukuh. The Dukuh announced the first village meeting; the Dukuh visited every house to explain the land registration process; the villagers fill in the registration form with the support of the Dukuh; checking of the documents and payments of the fees is done through the Dukuh; boundary conflicts are solved with the mediation of the Dukuh; the announcement of the certificate is done through the Dukuh; the certificates are handed out by the Dukuh (Reddick et al. 2011). In summary, the relation of the villagers to the Dukuh is crucial:

"his role is crucial in the success of the land registration process. The message of Larasita goes from the Dukuh to the village community. (...) Because the village community trusts the Dukuh as their leader, the Dukuh has the power to talk to the community and influence them to trust Larasita" (Reddick et al. 2011).

For those who do not agree with the results of the registration the interviews revealed that the villagers are somewhat detached from the formalities involved in the Larasita process:

We don't know about the announcement if the certificate is produced and distributed. We only know from the Dukuh when we will receive the certificate (Reddick et al. 2011).

The data collection on Larasita did not reveal any behaviour challenging the authority of the Dukuh, although in a completely free and voluntary registration this would even be a possibility for individual villagers. In fact, (Djoko 2013) found that the local villagers

are reluctant to apply for land certificate because they think that the land is hereditary from their ancestor and they do not need to register.(Djoko 2013)

In other words, the trust that community members have in their own local institutional arrangement (through the Dukuh) is the guiding principle to go ahead with Larasita or not, and to adhere to the principles and process of demarcation under Larasita or not. Larasita itself is in the eyes of local villagers more a vehicle to confirm their current perceptions of land tenure right arrangements rather than a vehicle to formalize their land tenure right arrangements in a (for them: new) state-based system. The behaviour of local people exhibit that adoption of Larasita is isomorphic to the social practices of the local community in its relation to the dukuh, and not isomorphic to the state-based rules and expectations of the national land registration system.

The difference between the state-based registration and the localised, more voluntary registration of Larasita is not so much in the registration requirements and end results, but in the process of obtaining the information and declaring the land tenure right boundaries. Instead of organizing this process by government officers or private agencies only, in Larasita the local community has a clear active role in this process. However, this role is largely entrusted to the Dukuh, just like any other process that occurs in the village. Essentially the villagers are therefore mimicking their behaviour in relation to other matters based on the trust they have in their local institutions: isomorphism again appears to be at play.

Although within the national land agency the Larasita program was high on the strategic agenda, the registration input from Larasita is relatively limited. Larasita is a very good way of explaining to politicians or the general public what land registration is all about. For these stakeholders Larasita is not seen as bus with technology: Larasita is more of a marketing tool- it shows the attitude of the national land agency in the execution of its work.

In summary, the Larasita process demonstrates the significance of isomorphism and institutional norms in alternative cadastre and land registry programs. It also provides another example of the interaction between conventional systems and neo-cadastrals: issues of interpretation and communication between the different stakeholder groups again emerge. Given the strength of the Dukuh in the process, the Larasita program is unlikely to be an artefact of the dissatisfaction with existing land holdings and uses.

Discussion

The three cases exhibit different ways which strategic behaviour of land information system designers and implementers occurs, in which land information systems solutions are sought to support particular political goals and which room is created for discretionary spaces in the design, implementation and use of the land information systems. Each of these is further discussed hereunder.

Strategic behaviour

Case	Kind of strategic behaviour
Uganda	Donor acquiescence: There is some behaviour which fits the different insights of foreign donors (Dutch, French, English, German, etc.) and a number of NGOs and UN Agencies (GLTN) which each have their own view on land registration, how to regard the problem and solution related to land. As a consequence they differ in what is important in the land information system design and maintenance of the associated land information systems. National conformity frames: often discussed as a dual system the land registration is not uniform. There is a strong tendency in the strategic discussions to make it more uniform, yet in reality this remains complex or perhaps even unwanted. The persistence of a dual system, or a system in which multiple system are accepted and acknowledged may be more accepted among stakeholders. Strategic behaviour is thus not uniform.
Rwanda	National conformity and uniformity: there is a strong preference to create a solution which fits all citizens and all government agencies, and to get away from the conflicts of the past. Modernization: The justifications rely on modernization narratives and converting Rwanda to the most modern State of Africa.
Indonesia	Centralism and decentral autonomy. Centralism is reflected in the formulation of a national spatial data infrastructure law, applying to the whole country and all agencies. At the same time there is a tendency to devolute execution to an increasing number of new local administrations.

Strategic solutions

The solutions are sought in an encompassing and universal system at a national level to cater for all types of land rights, for all land territory of the country and maintained, updated and controlled at a central point (usually the national ministry of lands).

Case	Kind of strategic solutions
Uganda	New capacity development strategies, re-confirming yet also changing the role of the Ministry of Lands. New land policies, including continuum of land rights.
Rwanda	Land tenure regularization program. Technocracy: Singapore is often mentioned in government communications as an ideal of a highly technically industrialised and strongly governed State
Indonesia	Spatial data infrastructure. Decentralization and devolution.

Discretionary space

There are multiple locations where discretionary space is created or used.

Case	Kind of discretionary space
Uganda	Discretionary space emerges on multiple places, including the capacity development formulation, assessment and execution. Also the frameworks for organisational development emphasize the role of the State, yet leave a

	lot of room for discretionary decisions when it comes to implementing and completing land information systems.
Rwanda	The adjudication process allowed some discretionary space. Although the process was strongly guided and regulated, many tasks were also filled in by temporary staff with little insight in the complete process of land registration of land administration. Boundaries in the field were examined and recorded by para-surveyors; land records were completed and checked by administrative staff. Secondly, the system design was completed with the support of multiple donor agencies and international projects. It is not always obvious which fundamental values are behind the technical system decisions.
Indonesia	In goals of spatial data infrastructure and priorities during the formulation of priorities to execute it. In formulating new regions / levels of administration At dukuh level. If local authorities have a clear influence in where and how boundaries are determined there is obviously the risk if discretionary space

Conclusion

Some initial conclusion can be drawn in relation to the main research questions:

- The choices in the land information design, implementation and maintenance are strongly connected to changing political goals. This makes not only the land information politically sensitive, but the land information systems also subject to certain politically driven or opportunistic priorities.
- Development of land information systems cannot be isolated from development or changing of institutional and legal frameworks.

Regarding the methodology the Q sorts should be extended with specific statements which reflect both power and control aspects on the one hand and a set of basic views on data and information systems. For the degree of necessity to work with and within a professional network and for the existing influence of this network in formulating and carrying through any system of values a further social network is necessary.

In sum, the next steps in this research will focus on finding more empirical evidence which can expose the hidden powers behind the choices of land information system design and implementation more evidently. This includes a further administration of a Q analysis in all other cases and the execution of a social network analysis all countries separately. In addition, a further induction of the different frames by which land information systems are developed, used and changed is still necessary. From the first observations and accumulated documentation it is clear that there are legacy (information and institutional) systems in place which strongly influence current choices. Yet, these choices are made in a changing organisational and political landscape, whereby priorities may be shaped by organisational, resource and political windows of opportunities.

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